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Sectoral shifts, unemployment and vacancies

An empirical analysis for the Netherlands

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In this paper the correlation between sectoral dispersion of employment growth and unemployment is analyzed. Empirical results for the Netherlands indicate that fluctuations in unemployment are due to aggregate demand factors, with no substantial influence of shifts in sectoral demand.

1. Introduction

In earlier business-cycle literature it is commonly assumed that changes in aggregate demand are the major cause of cyclical swings in unemployment. Lilien (1982), however, argued that cyclical changes in unemployment are mainly caused by shifts in sectoral demand for labour. In articles written shortly after Lilien's, his evidence was widely accepted [see a.o. Grossman, Hart and Maskin (1983)] but later his theory has been severely attacked by among others Neelin (1987) and Abraham and Katz (1986). Their main concern is the interpretation of a positive correlation between the dispersion of sectoral growth rates with unemployment as a causal relationship between the two. They show that the positive correlation between unemployment and sectoral shifts may be caused by a positive correlation between aggregate demand and sectoral shifts, combined with a negative correlation between aggregate demand and unemployment. Therefore, the observed (and widely reproduced) correlation between sectoral shifts and unemployment need not prove that there exists a causal relationship.

In this article, we investigate the influence of sectoral shifts on the functioning of the Dutch labour market. Following a suggestion of Yellen when commenting on an article by Blanchard and Diamond (1989) we have analyzed the influence of sectoral shifts in the context of a matching function of the labour market. A matching function describes the relationship between the number of vacancies and unemployment and the flow of filled vacancies. When a constant flow of filled

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vacancies, the traditional Beveridge curve is obtained. The use of a matching function enables us to make a distinction between a shift of the Beveridge curve without a shift in the efficiency of the matching process, and a change in the efficiency of the matching process itself.

2. Lilien's cyclical unemployment theory

Lilien assumes that the hiring rate h_t of a firm equals the aggregate hiring rate H_t plus a firm specific component ϵ_t:

$$h_t = H_t + \epsilon_t . \tag{1}$$

ϵ_t has a normal distribution with expectation 0 and standard deviation σ_t. h_t is defined as net hiring, which is equal to the sum of the quit rate and the rate of change of employment at the firm. Assuming that when $h < 0$ firms lay off workers and when $h > 0$ firms hire new workers Lilien derives the aggregate relations [Lilien and Hall (1986)]

$$H = A - L, \tag{2}$$

$$L = g(H, \sigma_t), \tag{3}$$

$$A = H + g(H, \sigma_t), \tag{4}$$

in which L is aggregate layoffs, A is aggregate accessions, and $-1 < g_1 < 0$ and $g_2 > 0$. Increases in the dispersion of hiring conditions as measured by σ lead to both greater L and A holding H constant. Under the condition that H is equal to negative the change in unemployment Lilien derives the following equation:

$$U_t = f(U_{t-1}, \sigma_t, X_t), \tag{5}$$

in which U is unemployment and X represents expectation errors in wages or prices, for which in the empirical estimates a measure of unanticipated money growth is used. As a proxy for σ_t the observed dispersion of industry employment growth rates is used. Estimating (5) Lilien found a significant positive effect of σ_t, indicating that sectoral changes influence unemployment. Essentially the same results were obtained by Samson (1985), using Canadian data and Kazamaki (1991), using Swedish data.

After initially being widely accepted, critics focused on the interpretation of the correlation Lilien and others found. Abraham and Katz for example indicate that a positive correlation between unemployment and the dispersion term not necessarily means that sectoral shifts rather than demand factors cause unemployment to fluctuate. They show that it is possible that sectoral shifts themselves are correlated with aggregate demand. There exist two situations which will cause this correlation between the dispersion term of employment growth and aggregate demand. The first is where industries' trend growth rates and cyclical sensitivities are negatively correlated [Abraham and Katz (1986)]. The second is where industries differ in their cyclical sensitivities and labour force adjustment costs are asymmetric, such that an increase in employment costs more than a decline of equal magnitude [Weiss (1984)]. The correlation that Lilien found between unemployment and sectoral shifts may therefore not be caused by sectoral shifts.

3. Sectoral shifts and the matching function

In this section we focus on an important relation for investigating the labour market: the matching function. It is an empirically well established fact that the flow of filled vacancies is well described by a constant returns to scale Cobb–Douglas matching function with unemployment and vacancies as 'production factors' [Blanchard and Diamond (1989), Jackman, Layard and Pissarides (1989), Pissarides (1990), Van Ours (1990)]:

$$F = kU^{\alpha}V^{1-\alpha} \tag{6}$$

in which F is the flow of filled vacancies, V is the number of vacancies and k is a parameter indicating the efficiency of the matching process. Pissarides (1990) contains an argument for the existence of a matching function, in which he draws an analogy with a production function. Moreover, he advocates constant returns to scale, because in an economy with steady-state growth this is the only assumption that yields a constant unemployment rate. The Beveridge curve may be obtained from the matching function under the condition that the flow of vacancies is constant.

The relationship between the matching function and the sectoral dispersion in employment growth is obvious. A large dispersion in employment growth between sectors means that in some sectors vacancies will be created, while in others workers become unemployed. A higher sectoral dispersion of employment growth will generate at the same time more new vacancies and new unemployed. If the inflow in both unemployment and vacancies increases, we get an outward shift of the Beveridge curve.

A change in the sectoral growth processes may also influence the matching process itself, if intrasectoral matching differs from intersectoral matching. Intrasectoral matching means that a vacancy in a certain sector is filled with an unemployed from this same sector, while intersectoral matching means that a vacancy in a certain sector is filled with an unemployed from some other sector. Matching within the same sector is easier, because it is easier to evaluate the future productivity of an applicant, while training costs will be less, and the applicant knows probably more about non-wage characteristics of the job. Therefore it takes less time to form a match if both the unemployed worker and the vacancy are from the same sector. An increase in the dispersion of employment growth rates means that intersectoral matching becomes more important. As the efficiency of intersectoral matching is lower than the efficiency of intrasectoral matching, this causes the average efficiency of the matching process to decrease.

Concludingly, there are three possible explanations for an empirical correlation between σ and U. Firstly, there may be no causal relation between σ and U if both depend on aggregate demand. Secondly, there may be an influence of σ because of the increase in the number of newly created vacancies and unemployment, thereby shifting the Beveridge curve. Thirdly, changes in the dispersion may cause the average efficiency of the matching process to decline.

4. An empirical analysis for the Netherlands

We started our empirical analysis with a replication of Lilien's analysis, for which we used Dutch yearly data of the period 1971–1987. The sixties were excluded from the analysis, because of a structural break in the performance of the Dutch labour market at the end of the sixties [Van Ours (1991)]. The developments in the numbers of unemployed and vacancies, as registered at the public employment offices, are shown in fig. 1. From this figure it appears that the number of unemployed increased substantially in the Netherlands, especially over the period 1980–1983, in which unem-

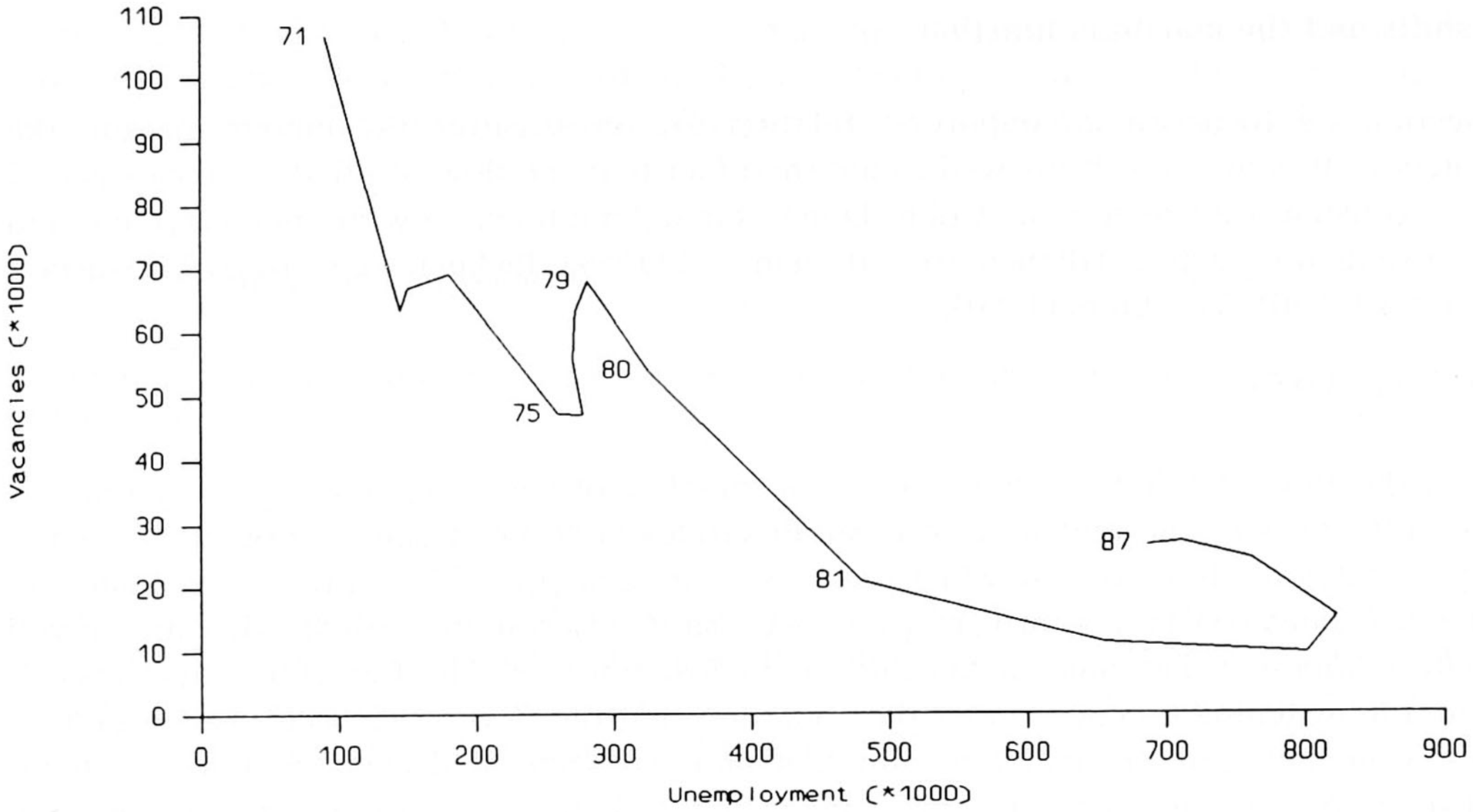

Fig. 1. Unemployment and vacancies in the Netherlands; 1971–87.

ployment rose with some 400.000 workers. The number of vacancies shows an opposite movement, from about 100.000 in 1971 to about 10.000 in 1983. The sectoral dispersion parameter based on a 24 sector classification is shown in fig. 2. In the seventies there is some decline in the sectoral dispersion, but in the beginning of the eighties when unemployment rose rapidly the dispersion parameter increases substantially, to decline after 1982.

In our first estimates we also used an unanticipated monetary growth variable, which was skipped from the analysis since it appeared to have no significant effects. The final estimation

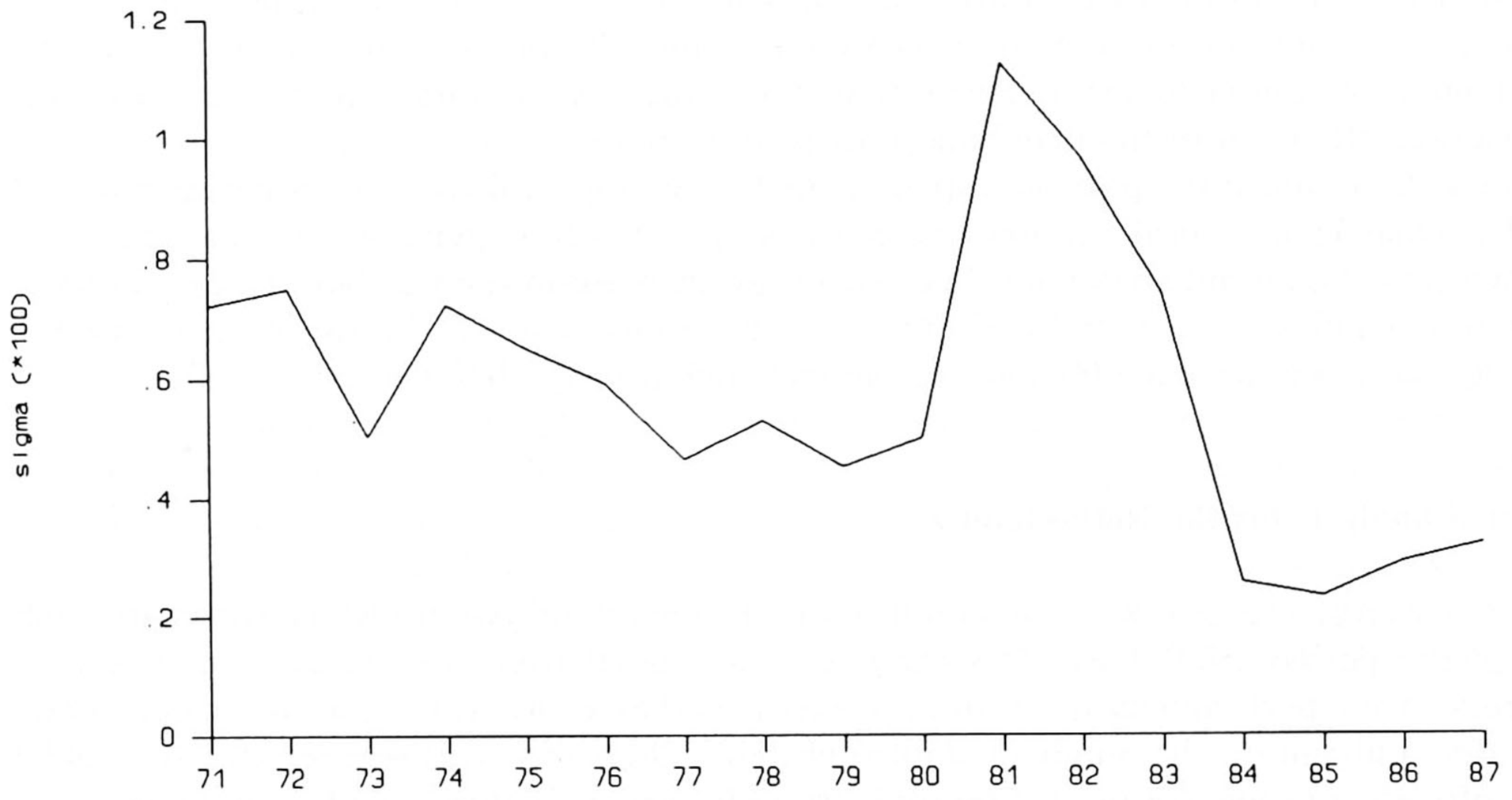

Fig. 2. Sectoral dispersion parameter; 1971–87.

Table 1
Estimation results; 1971–1987. [a]

Dependent variable	σ	$u(-1)$	$v(-1)$	v	α	R^2	DW
u	0.53	0.95				0.982	2.17
	(5.0)	(28.4)					
v	−1.28		0.96			0.930	1.65
	(6.5)		(15.0)				
u	0.22	0.76		−0.20		0.987	2.36
	(1.5)	(9.8)		(2.7)			
f_v	0.13				0.32 [b]	0.875	1.39
	(1.2)				(16.1)		

Dependent variable	σ	∇v	α	R^2	DW
∇u	0.59			0.690	1.99
	(6.0)				
∇v	−1.33		0.766	1.70	
	(7.3)				
∇u	0.28	−0.23		0.730	1.41
	(1.4)	(1.8)			
∇f_v	0.07		0.41 [b]	0.653	2.01
	(0.1)		(7.2)		

[a] u, v, f_v: logarithms of variables;
[a] t-values in parentheses; R^2 adjusted for degrees of freedom; DW = Durbin-Watson statistics, constant not shown.
[b] From an F-test it appears that the constant returns to scale hypothesis cannot be rejected.

results are shown in table 1. The coefficients of the lagged endogenous variables in the first two estimates do not differ significantly from 1. Therefore, we also estimated with $\nabla \log(U)$ and $\nabla \log(V)$ as dependent variables. Because of the low Durbin–Watson statistic in estimate 4 we tried first differences in this case. The estimates 5–8 do not differ substantially from the estimates 1–4. To correct for the possible endogeneity of σ and other explanatory variables, for estimates 5–8 we also used instrumental variables, but this did not influence our main conclusions [see Van Ours and Van der Tak (1991) for these results].

The estimation results show a significant positive correlation between σ and unemployment, which seems to confirm Lilien's analysis. However, as in the analysis of Abraham and Katz (1986), we also find a significant negative correlation between σ and the number of vacancies. If we include σ in a Beveridge curve type estimate its influence disappears. In a matching function estimate σ has no significant coefficient. So, there is no influence of σ on the matching process on the Dutch labour market.

5. Conclusions

In this paper, we distinguish three possible explanations for the correlation between a measure for the dispersion in employment growth and unemployment. The first explanation is due to a.o.

Abraham and Katz (1986): Aggregate demand and sectoral shifts are correlated. There seems to be a correlation between sectoral shifts and unemployment, while there is in fact a correlation between aggregate demand and unemployment. The other two are real sectoral shift explanations. The first sectoral shift explanation hinges on the influence of dispersion in employment growth on the Beveridge curve. The Beveridge curve is in fact an iso-flow matching function. Pure sectoral shifts, in which total demand for and supply of labour do not change, cause an increase in the flow of newly created vacancies and new unemployed. This causes an outward shift of the Beveridge curve. The second sectoral shift explanation investigates the matching process in more detail. Intrasectoral matching may have a higher efficiency than intersectoral matching. With increasing dispersion in employment growth the amount of intersectoral matching increases relative to the amount of intrasectoral matching. This may cause a decrease in the average efficiency of the matching process.

Our empirical analysis for the Netherlands shows a positive correlation between the dispersion of employment growth and unemployment. There is, however, also a significant negative correlation between the dispersion of employment growth and the number of vacancies. Furthermore we find no influence of the dispersion parameter on the Beveridge curve or on the matching function. All this suggests that fluctuations in unemployment are largely due to aggregate demand factors, with no substantial influence of shifts in sectoral demand.

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